Risk factors for the development of emotional and behavioural problems in children born to drug-dependent mothers

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DOI: https://doi.org/10.1007/s00787-006-0568-x

Eur Child Adolesc Psychiatry (2006)
15:460–466 DOI 10.1007/s00787-006-0568-x

ORIGINAL CONTRIBUTION

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Abstract *Background* The study of biological and psychosocial risk factors for the development of emotional and behavioural problems in children of drug-dependent mothers. *Methods* In a sample of 52 children and drug-dependent mothers participating in a residential intervention programme emotional and behavioural problems were studied in the children by use of the Child Behaviour Checklist (CBCL). The Symptom-Checklist Revised (SCL-90-R) served to assess mental problems in the mother. Drug exposure during pregnancy, various psychosocial risk factors due to the drug-career, and educational status of the mother were assessed by maternal interview. A brief assessment of intelligence of the mother was included. *Results* Among the various biological and psychosocial risk factors, maternal mental health problems, maternal educational status, and a small number of close social relationships correlated significantly with child outcome variables. Multiple regression analyses identified maternal mental health factors as the main predictors of child behaviour. *Conclusions* Assisting drug-dependent mothers in overcoming the psychosocial sequelae of drug abuse implies also assistance to the children in terms of prevention of emotional and behavioural problems.

Key words drug abuse – mothers – behaviour problems

Accepted: 23 June 2006
Published online: 8 September 2006

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Introduction

There is clear evidence that the offspring of drug-dependent mothers is at a heightened risk of developing various sorts of mental disorders and poor psychosocial functioning [4, 7, 9, 12, 16, 17, 20, 22, 25, 27, 28].

Various factors may contribute to this heightened risk including biological, psychosocial, and sociocultural factors. Among the various biological factors intrauterine exposure to drugs besides genetic factors is one of the first risks for the developing child. This type of risk for later emotional and behavioural problems has been particularly studied for intrauterine exposure to cocaine [1, 6, 10, 15, 21, 22]. Further biological risk factors include perinatal hazards including premature birth, low birth weight, small far gestational age [21, 24], and HIV-infections [20].

In addition, various psychosocial and socio-cultural risk factors are jeopardising the development and functioning of children born to drug-dependent mothers. These risks include low socio-economic status and limited social support [14, 16], comorbid mental disorder and functioning of the mother [1, 13, 16, 20], physical abuse [1, 13, 16, 20], and residential placement or foster care [10].

Among these various risk factors prenatal drug exposition, maternal mental functioning, and the quality of the social environment are perceived as being of predominant importance [5]. However, so far in the majority of studies the interaction of these factors has not been studied sufficiently. Furthermore, the majority of studies comes from North American backgrounds with a large group of Afro-American subjects coming from relatively deprived areas whereas there are only a few European studies. Finally,

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most of the studies are based on assessments of rather young children, i.e., of infants and toddlers only.

Thus, the present study was aiming for an assessment of the relative impact of various biological risk factors including prenatal drug exposition, pre- and perinatal risk factors, various psychosocial risk factors including indicators of educational background of both parents and social support, and the mental state of mothers with drug-dependency on emotional and behavioural problem in their offspring. These Swiss children spanned the age-range from infancy to school age so that age could be studied as an additional factor of interest.

Methods

Sample

The 52 subjects of the present study were recruited from two Swiss residential treatment programmes for drug-dependent mothers and their children. As can be seen from Table 1 the age range of the children is wide and covers both very young and older children. There were 14 (27%) children between 2 and 3 years and 38 (73%) children between 4 and 14 years of age. There was a slight excess of females (58%) and only a minority of 25% lived with both parents. The proportion of single mothers was large (42%) and 23% stayed with the residential treatment programmes at the time of the assessment. Few children lived in foster families (6%) or in institutions (4%). The educational status of the children matched the age distribution of the sample.

The mothers were on average in their early thirties and had a long-standing drug-abuse history. They had been abusing drugs before, during and after pregnancy and more than a quarter were not yet abstinent at the time of examination. During pregnancy nicotine, heroin, cannabis, methadone, cocaine, and alcohol had been abused in descending frequency and on average two to three different drugs had been abused.

Procedure

The outcome in terms of emotional and behavioural problems of the children was studied by use of the age-appropriate versions of the Child Behaviour Checklist, i.e., the CBCL/2–3 and the CBCL/4–18 [2, 3]. From these scales the two secondary scales measuring internalizing and externalizing problems and the total problem score were computed. All statistical analyses had to be based on raw scores due to the lack of a local standardisation for the CBCL/2–3.

Table 1 Sample and clinical characteristics ($N = 52$)

Age of the child (years)	
Mean	6.88
SD	3.47
Range	2–14
Gender	
Male	22 (42.3%)
Female	30 (57.7%)
Domestic arrangement	
Family	13 (25%)
Single mother	22 (42.3)
Foster family	3 (5.8%)
Residential treatment programme	12 (23.1%)
Institution	2 (3.8%)
Educational status	
Not yet applicable	3 (5.8%)
Kindergarten/playgroup	27 (51.9%)
Primary school	19 (36.5%)
Secondary school	3 (5.8%)
Maternal age (years)	
Mean	32.0
SD	4.24
Range	21–43
Type of drug use during pregnancy	
Nicotine	42 (80.8%)
Heroin	27 (51.9%)
Cannabis	22 (42.3%)
Methadone	14 (26.9%)
Cocaine	13 (25.0%)
Alcohol	11 (21.2%)
Other	13 (25.0%)

Data on the various risks factors were predominantly obtained from a structured interview with the mothers. First, a detailed drug history asked for the type and number of drugs that had been used during pregnancy. An index of prenatal drug exposure was constructed by summing up the various substances with each drug having the same weight. In order to control for various types of drug exposition the following scores were calculated: (a) total member of drugs, (b) all drugs except nicotine, (c) all drugs except nicotine and cannabis, and (d) all drugs except alcohol.

In addition, the interview with the mother assessed the following prenatal risk factors: bleedings, hypertension, persistent and severe vomiting, infections, radiological examinations or treatments, medications, surgical interventions including anaesthesia, severe mental suffering, hospitalisation due to imminent miscarriage, severe illness, previous miscarriages, previous premature termination of pregnancy, and previous complicated pregnancies. Furthermore, clinical birth records were obtained for all participating children and checked for prematurity, small for gestational age and neonatal withdrawal symptoms. From the entire set of pre- and perinatal data a pre- and perinatal risk factor index was calculated by summing up the various item with each having the same weight.

In a similar way the following items were summed up for a neonatal risk factor index: failure to suck, seizures, treatment in isolette, neonatal jaundice including fototherapy, intensive care, fractures due to delivery, laboratory pathology, life-threatening diseases, other complications. Withdrawal symptoms were coded as an independent risk.

Further sections of the structured interview dealt with parental educational status, current domestic arrangements and the number of family members and relatives to whom the child had close relationships. From the latter an index of close relationships was calculated by summing up the following items: mother, father, stepfather, concubinating partner of the mother, grandmother, grandfather, foster mother, foster father, other relatives.

Finally, the interview covered various psychosocial risk factors including separation of the parents, single motherhood, death of the father, HIV infection of the mother and/or father, preceding institutional care, current institutional care, drug-abuse after pregnancy, and current drug abuse. Again an index was calculated by summing up the individual items with each having the same weight.

The mothers were assessed with regard to current mental symptoms and intelligence. The former were studied by use of the German adaptation of the Symptom Checklist (SCL-90-R) [11] covering 90 items in the following nine domains: somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, anger–hostility, phobic anxiety, paranoid ideation, and psychoticism. Furthermore, three additional second-order scores can be computed: a global severity index (GSI), a positive symptom distress index (PSDI), and a positive symptom total (PST). The German standardisation is based on *T*-scores (Mean = 50, SD = 10) and scores of $T > 60$ are considered as being indicative of significant mental distress.

Intelligence of the mother was assessed with the Figure-Connection Test [19] which is a brief estimation test and measures cognitive speed of processing. It takes only 5–10 min and allows the calculation of an IQ based on a large German standardisation sample. Maternal educational status was rated according to academic training and ranged from uncompleted academic training to university graduation.

Statistical analyses tested for univariate associations of the various risk factors with the three child outcome measures by calculation of Pearson's or Spearman's correlations or Mann–Whitney tests in the case of binary variables. Additional multiple regression analyses were computed in order to identify those factors that carry independent risks on outcome.

Results

The various indices used in the correlational analyses showed the following distributions. The number of drugs abused during pregnancy (see Table 1) ranged from 0 to 6 (Mean = 2.78, SD = 1.80). The figures for the pre- and perinatal risk factors were ranging from 0 to 10 (Mean = 3.50, SD = 2.29) and for neonatal complications from 0 to 6 (Mean = 0.89, SD = 1.37). The respective figures for number of close relationships ranged from 1 to 7 (Mean = 3.96, SD = 1.39). Finally, the range of psychosocial risk factors was 0–7 (Mean = 3.56, SD 1.21). A total of 13 mothers (25%) had a GSI score that was indicative of significant mental distress. The same applied to the PSDI of 18 mothers (35%) and the PSI of 10 mothers (19%).

From the correlational matrix of the various risk factors with the three outcome measures of child emotional and behavioural problems (i.e., internalizing, externalizing and total problems) only a few were significant. Univariate correlations are shown in Table 2. There were no significant associations between the various indeces of prenatal exposure to drugs, the index of pre- and perinatal risk factors, the index of neonatal risk factors, age and the outcome measures. A higher number of close relationships significantly correlated with lower total problem scores. Higher maternal educational status had a significant association with lower internalizing problem scores in the children.

Correlation coefficients between maternal mental symptoms and child outcome measures are shown in Table 3. All indicators of maternal mental problems significantly correlated with internalizing problem scores in the child. The pattern was less consistent for externalizing problem scores; only maternal compulsiveness, insecurity in social relationships, and the GSI correlated significantly with externalizing problems in the child. The total problem score had a stronger pattern of associations with maternal mental problems as indicated by compulsiveness, interpersonal sensitivity, depression, anger–hostility, paranoid ideation, the GSI, the PSDI, and the PST. There were no significant correlations between maternal IQ and child outcome measures ($r = -0.07$ to -0.16, n.s.).

Multiple regression analyses were performed separately for the prediction of the three outcome variables. Considering the moderate sample size, both stepwise and hierarchical procedures were performed. The following variables were tested as predictors: age of the child, gender, prenatal drug exposure index, pre- and perinatal risk factor index, psychosocial risk factor index, number of close social relationships, maternal educational status,

Table 2 Correlation coefficients between biological and psychosocial risk factors and child outcome scores

	Internalizing problems		Externalizing problems		Total problems	
Risk factors	*r*	*P*	*r*	*P*	*r*	*P*
Number of prenatal drugs (total)	0.02	n.s.	0.02	n.s.	0.11	n.s.
Number of prenatal drugs excluding nicotine	0.02	n.s.	−0.02	n.s.	−0.09	n.s.
Number of prenatal drugs excluding nicotine and cannabis	0.00	n.s.	−0.04	n.s.	0.06	n.s.
Number of prenatal drugs (excluding alcohol)	0.03	n.s.	0.03	n.s.	0.12	n.s.
Number of pre- and perinatal risks	−0.01	n.s.	−0.23	n.s.	−0.10	n.s.
Number of neonatal risks	0.03	n.s.	−0.05	n.s.	−0.07	n.s.
Age of the child	−0.10	n.s.	−0.10	n.s.	−0.36	n.s.
Number of close relationship	−0.26	n.s.	−0.25	n.s.	−0.37	0.008
Number of psychosocial risks	0.24	n.s.	0.16	n.s.	−0.26	n.s.
Maternal educational status	−0.29	0.04	−0.21	n.s.	−0.25	n.s.
Maternal intelligence	−0.07	n.s.	−0.16	n.s.	−0.16	n.s.

Table 3 Correlation coefficients between maternal mental symptom scores and child outcome scores

	Internalizing problems		Externalizing problems		Total problems	
Maternal mental symptoms	*r*	*P*	*r*	*P*	*r*	*P*
Somatization	0.45	0.001	0.08	n.s.	0.22	n.s.
Obsessive–compulsive	0.49	0.000	0.36	0.01	0.48	0.001
Interpersonal sensitivity	0.43	0.002	0.38	0.007	0.45	0.001
Depression	0.41	0.004	0.27	n.s.	0.32	0.03
Anxiety	0.33	0.02	0.25	n.s.	0.27	n.s.
Anger–hostility	0.39	0.007	0.22	n.s.	0.29	0.05
Phobic anxiety	0.17	n.s.	0.09	n.s.	0.15	n.s.
Paranoid ideation	0.39	0.007	0.21	n.s.	0.31	0.03
Psychoticism	0.30	0.04	0.13	n.s.	0.19	n.s.
Global Severity Index (GSI)	0.47	0.001	0.30	0.04	0.38	0.008
Positive Symptom Distress Index (PSDI)	0.37	0.01	0.27	n.s.	0.37	0.01
Positive Symptom Total (PST)	0.53	0.000	0.21	n.s.	0.36	0.01

maternal IQ, and the various indicator of maternal mental symptoms.

In the stepwise procedure the demographic variables were entered first, followed by the various child risk factors, and all maternal variables. In all these analyses, only maternal interpersonal sensitivity was a significant predictor of all three-child outcome variables (BETA coefficients ranging between 0.52 and 0.53, each $P < 0.001$). When considering only the GSI rather than all SCL-90-R domains in addition to all the previous mentioned variables, it was only the GSI that significantly predicted the three child outcome variables (BETA coefficients ranging between 0.52 and 0.57, each $P < 0.001$).

In the hierarchical procedure the order of entry of the various predictors was systematically changed and among the SCL variables only the GSI was used. In all these different models only the GSI turned out to be a significant predictor of the three child outcome measures (BETA coefficients ranging between 0.46 and 0.53, each $P < 0.01$).

Discussion

This study systematically tested a large set of risk factors for the development of emotional and behavioural problems in the offspring of drug-dependent mothers. The age range of the children was not confined to infancy and toddler age but, rather, covered also the school age period. With these features of the design the present study allowed a test of a more comprehensive set of predictors of emotional and behavioural problems in children of drug-dependent mothers than in previous studies with either a more restricted scope of risk factors and/or a limited age range of the children.

On the univariate level there was an association of some risk factors with the outcome parameters whereas others did not show such an association. First, there was no association of the prenatal drug exposure index with the child outcome variables. These lacking associations were obtained even when the very frequent exposure to nicotine, cannabis,

and alcohol was controlled for. This finding stands into contrast with our own findings that prenatal drug exposure predicts cognitive development of these children [26]. The present negative findings may in part be due to the fact that the amount of drug exposure during pregnancy was rather low as indicated by the figures that were obtained from the maternal interview including a relatively high rate of 27% of mothers with methadone substitution during pregnancy. At least in a subgroup of the affected children methadone may have prevented the periodic intrauterine withdrawal symptoms of drugs like heroin that contribute to the high rate of perinatal hazards including prematurity, small for gestational age and neonatal withdrawal symptoms [17].

In fact, also the pre- and perinatal risk factors index did not show a significant univariate correlation with the child outcome variables. Again, this may partly be due to the relatively low rate of the respective risk factors due to improved prenatal care (i.e., methadone substitution) and/or low maternal recalling rate of these events. However, our findings on a significant association of pre- and perinatal risk factors and cognitive development in the same sample [26] run counter to a systematic bias due to unreliable maternal recall. Since our sample was also marked by a very low rate of children who had been separated from their mothers during their life, there may be some additional evidence that these mothers may have been more concerned about the pregnancy and less hazardous in their drug-dependent life style than mothers seen in other studies. Some evidence that lower amount of drug abuse during pregnancy is also associated with less mother–child separation comes from the study by Accornero et al. [1].

The few significant univariate correlations should be regarded with caution because of the large number of coefficients. However, as long as they are in accordance with previous studies some conclusions may be derived from these findings even without adjustment for chance findings. The strongest univariate predictors of child problems were the size of the network of close relationships, maternal educational status, and indicators of maternal mental problems. From these analyses it is clear that a larger number of close relatives may have a buffering effect on child emotional and behavioural problems. This finding is in accordance with the observation, that families with drug-dependent parents live in social isolation and by this very nature create additional risks for the development of their children [14]). The present study also showed that a number of more specific psychosocial risk factors dealing with the disruption of the family due to experiences like paternal death, parental HIV-infection, and institutional care tend to have a significant association with poor child outcome. Similar findings have been obtained also in other studies [1, 8, 14, 16, 20].

Among the various maternal characteristics only intelligence did not show a significant association with child outcome. This finding is not in accordance with the conclusion by Bennet et al. [5] from various studies that low maternal intelligence has a negative effect on behaviour particularly in young children. Perhaps, sample differences in terms of a less skewed intelligence distribution in the present sample may have precluded a replication. Both the wider age range of the present study and the different composition of this Swiss sample with no ethnic minorities and no subjects from deprived large metropolitan areas like in the US samples may have contributed to the lack of an association of maternal intelligence and child problems. Furthermore, it has to be admitted that in the present study assessment of intelligence was based on a brief test only.

In contrast, in the present study it became evident that low educational status correlated significantly at least with child internalizing problems matching the findings of the study by Ornoy et al. [18]. As expected, almost all indicators of maternal mental problems had significant associations with child internalizing problems. The associations were less strong for child externalizing problem. Despite these minor differences the present study found strong evidence that maternal mental problems significantly associate with child mental problems matching the findings by Accornero et al. [1] and Pilowsky et al. [20]. It may be argued that these associations mainly reflect maternal perceptions so that mothers with high scores of mental problems have a more negative view of their children. However, as Richters [23] in an analysis of various studies has shown maternal reports match independent ratings in 83% of the findings and depressed mothers provide the same or even better ratings of the child's behaviour in comparison to non-depressed mothers. Furthermore, Cicchetti et al. [8] found congruent ratings of mothers and fathers in their study. Taken together, these various findings do not argue for a strong perceptual bias in the mothers with mental problems.

Finally, multiple regression analyses looked for the strongest predictors of the child outcome measures. Because of the moderate sample size both exploratory stepwise and hierachical procedures were employed in order to finally arrive at a small number of variables that were appropriate for the sample size. In these ultimate tests of multiple associations of the various risk factors with child behaviour outcome, only maternal mental health factors were significant. This finding stands in contrast to our parallel study of the cognitive outcome in these children with an im-

pact of various biological risk factors [26]. Emotional and behavioural problems of children of drug-dependent mothers may be predominantly predicted by maternal mental problems. These findings emphazise that in the child's best interest it is the direct family environment that has to be stabilised and that drug-dependent mothers need to be supported particularly with regard to their mental health in order to reduce the risk of their children to develop serious emotional and behavioural problems.

One way to prevent these problems is the conjoint residential treatment of drug-dependent mothers and their children in specific programmes combining interventional and educational aims for both mother and children. This was also the background of the present study since all subjects were recruited from two institutions providing this kind of interventions. The specific recruitment, the moderate sample size, and the moderate amount of significant maternal mental distress with indicators varying between 19% and 35% imposes also a limitation to the generalisation of findings from this study. It is not clear whether the present findings apply also to the large group of drug-dependent mothers and children who live under less favourable conditions at the edge of the community and society, with less or no social support, and without professional intervention. However, this limitation is shared with many of the available studies, which are almost exclusively based on samples that were also studied in treatment programmes. Similarly, the present and other studies rely on maternal recall of drug exposure during pregnancy. It may well be that the duration of time after pregnancy may have precluded some mothers to adequately remember the duration and amount of ingested drugs.

Furthermore, it has to be acknowledged that the present sample was rather small. However, the use of aggregated data and the hypothesis-driven analyses served against the probability of pure chance findings. Finally, the cross-sectional nature of the study does not allow any conclusions dealing with causal relations between maternal and child variables. Only prospective studies would allow these kinds of delineations.

Acknowledgements The author would like to thank all the participating mothers and children of the present study and the two teams of the supporting residential treatment centres, particularly Elisabeth Frei on behalf of "Die Alternative" and Verena Schäfer on behalf of "Sozialtherapeutische Gemeinschaft Ruedli".

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